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PEOPLEWARE: THE MOST CRITICAL COMPONENT OF A SUCCESSFUL TECHNOLOGY TRANSFER PROGRAM

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I. THE NEED FOR TECHNOLOGY

In the final report of the Independent Commission on International Development Issues, entitled "North-South: A Programme for Survival,"[1] it is clearly stated that the search for a solution to the problem of the widening economic disperity between the North and South, between the developed and less developed countries, should "focus not on machines but on people." Historically, the experiences of the advanced countries have demonstrated the importance of skilled human resources in the development process.[6,3,5] It has been proven that "natural resource endowment is a necessary, but not a sufficient requirement for progress."[7] The slow rate of development in over two-thirds of the world is, therefore, the consequence of failure to make adequate use of human resources.

When human resources are not developed, developmental planning is neglected and the rational utilization and conservation of natural resources is hampered. And yet, experience in the application of space-acquired remote sensing data for the preparation of basic, multi-discipline cartographic information has demonstrated that this advanced technology can be effective in meeting the basic cartographic information needs of developing countries. How can an advanced technology be successfully transferred from its sources in the developed countries to those who need it in the developing world?

II. THE APPROACH ADOPTED AT LARS

In order to achieve successful results in the process of transferring remote sensing technology, Purdue/LARS has adopted a strategy whereby the human resources of a nation are first developed through long-term educational and training programs and then remote sensing institutions are developed and strengthened locally to carry on the work. The premise supporting this approach acknowledges that the essential components of any digital remote sensing image processing system include not only hardware and software but also peopleware. No matter how sophisticated the computer and the software may be, without the involvement of well-qualified personnel, the system becomes useless.

The approach adopted at LARS emphasizes the training of well-selected individuals in a technology that is appropriate for answering the resource information questions of their own countries. A key to success lies in selecting the appropriate aspects of the technology to teach and then transforming these fundamentals into easily understood formats which allow the technology to be accessible to those who can use and improve it. In doing this, however, the instructors in no way compromise the technical depth needed for a thorough understanding of the technology.

The best environment for training scientists is a residency program that is conducive to independent study and research. The hardware and software should be transparent, allowing close scrutiny and wide experimentation on the part of the scientist. Personal assistance from experienced analysts should be available on a day-to-day basis with frequent consultations with senior scientists for goal setting. A good research library is also essential. Occasionally, scientists may embark on a residency program for only a few days, but, in general, the most successful are those who do so for six to eight months or

more. In this period of time they can develop their understanding to the level where they are able to plan and complete a research project of significance to their own countries.

III. A CASE STUDY EXAMPLE: BOLIVIA

The experience of the Bolivian ERTS Program serves as a model for international technology transfer. After a successful national cartographic project which helped develop the expertise of a group of scientists working in visual interpretation of Landsat data, it was recognized that the enormous amount of information contained in the data could be more efficiently analyzed using computer-aided analysis techniques. A cooperative research effort was established between the Bolivian ERTS program and Purdue University for the needed training.

Fifteen Bolivian scientists, from different disciplines, studied at LARS, attending a one-week short course and studying as visiting scientists. Once scientists could anticipate their needs well enough to design an appropriate system and once the human resources had been prepared to maintain and use the system, Bolivia was ready to have its own system; the required hardware and software were then put in place. The Bolivian ERTS Program continues to use this system to map specific areas of the country at a high level of detail. Even more important to the growth of remote sensing in Bolivia is that, from this people-rich environment, interest has spread to the universities, where several theses have been written using this system.[2,4,8,9]

The cooperative effort continues: Purdue/LARS has recently completed a project for conceptualizing and designing a Digital Geographic Information System for the entire Bolivian territory and for developing and implementing this sytem in the Oruro Department.

IV. CONCLUSION

Long term cooperative programs are beneficial to both the recipients of the technology and the providers of the information. The heart of the program lies not in the exchange of equipment or software but in the interaction among people who together can research and design systems that truly meet the resource information requirement of a country.

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Shirley M. Davis is Senior Education and Training Specialist at Purdue University's Laboratory for Applications of Remote Sensing and Director of Independent Study, Continuing Education Administration. Mrs. Davis received the A.B. degree with honors in English in 1958 from Sweet Briar College and the M.A. degree in English from Case-Western Reserve University in 1962. Her major contributions to remote sensing education have been as co-author and editor of the LARSYS Educational Package; co-editor and contributing author of the textbook Remote Sensing: The Quantitative Approach; Chairman of the 1981 Conference on Remote Sensing Education; and creator/coordinator of the videotape series Introduction to Quantitative Analysis of Remote Sensing Data. Her recent work has involved the development of educational materials for digital image processing.

Luis A. Bartolucci received his B.S., M.S., and Ph.D. in Geophysics from Purdue University. Dr. Bartolucci has been involved in Remote Sensing Research since 1969. He has played an active role in the development of remote sensing technology for applications in the area of water resources and has also made outstanding contributions in the field of thermal infrared radiation for remote sensing applications. In addition, Dr. Bartolucci has served as consultant to the U.S. Information Agency, the U.S. Agency for International Development, the InterAmerican Development Bank and to several Latin American development agencies. He has been Principal Investigator and Project Director of several domestic and international research and training programs involving computer-aided processing and analysis of remotely sensed data for earth resources inventories.

Carlos R. Valenzuela holds a B.S. from the Agricultural State College, Deventer, The Netherlands, a M.S. from the International Institute for Aerial Survey and Earth Sciences (ITC), Enschede, The Netherlands and he is a Ph.D. candidate at Purdue University. He has been Soils Investigator at the ERTS/GEOBOL Bolivian Remote Sensing Program from 1977 to 1980, in charge of developing soil survey methodologies using Landsat MSS data. Mr. Valenzuela has participated as a Visiting Scientist at the Laboratory for Applications of Remote Sensing (LARS) in the developing of a Geographic Information System for Bolivia. He has also taught a Remote Sensing course at the University of Ball State at graduate and undergraduate levels. Currently, he is a Research Instructor at the Laboratory for Applications of Remote Sensing of Purdue University.